the first moving across from the 21st to 24th, and the second on the 26th and 27th. Warnings of these two cold waves were issued well in advance of their approach.

Vesselmen on Lake Michigan were kept fully informed as to the expected movement of storms during the month, and no casualty from stress of weather has been reported.—*H. J. Cox, Professor.*

SAN FRANCISCO FORECAST DISTRICT.

From the 2d to the 7th, inclusive, warnings of severe frosts, probably injurious to citrus fruit in exposed places, were issued throughout California. These warnings were fully verified, all Weather Bureau stations reporting heavy or killing frosts on those dates. The usual precautions were taken in the citrus belt to prevent injury, and it is believed that no damage was sustained. There were no important conditions which were not forecasted in due time.—*G. H. Willson, Local Forecast Official.*

PORTLAND, OREG., FORECAST DISTRICT.

River forecasts were issued on the 6th, 7th, 8th, 9th, and 10th, and were most favorably commented upon by people along the water front. The feature of the month was the cold period from the 1st to the 8th. Temperatures of zero and slightly below were reported from a few of the more exposed places west of the Cascades, and zero temperatures were general east of them. In portions of Washington, Oregon, and Idaho the lowest temperature on record was observed; this was especially true in the region about Baker City, Oreg. The accuracy of the forecast during this period was made the subject of much favorable comment. During the last half of the month much damage to grain and orchards was reported; the damage was not, however, as great as estimated. The unusual severity of the weather of the month caused a great demand for information upon the local office.—*B. S. Pague, Forecast Official.*

AREAS OF HIGH AND LOW PRESSURE.

During the month there were six highs and nine lows sufficiently well defined to be traced on Charts I and II. In these charts the center of each circle represents the position of the high or low on the date and hour inscribed within. There is also entered in the circle the reading of the barometer near the center. In many cases this reading is quite approximate, especially when the high or low is on the border of the observation region. It should also be noted that sometimes the center has been located by the direction of the winds about it, and not necessarily by the highest or lowest reading of pressure. This is especially the case in the mountain and Plateau regions.

The principal facts regarding the date and place of first and last appearance, the duration, and velocity of these highs and lows are given in the accompanying table, and the following remarks are added:

Highs.—The month has been remarkable in a good many respects. Nearly the highest pressure ever observed in the United States and Canada, 31.42 inches, was reported at Swift Current on the morning of the 11th, and this was a reinforcement of a high area that had been nearly stationary there, or stretching in a ridge of high pressure in a southeast direction to the middle Mississippi Valley since the morning of the 6th. In connection with this ridge of high pressure extremely low temperature was noted in a rather narrow strip from Montana to the middle Atlantic coast. At Washington a temperature of 15° below zero was experienced at 8 a. m. of the 11th, which was 1° below the lowest ever noted by the Weather Bureau, and this was a radiation cold rather than the cold of a cold wave.

All the highs were first noted to the north of Montana and moved in a southeast direction to the Mississippi Valley, and thence east and northeast to the Atlantic coast. Numbers I and V disappeared off the south Atlantic, II off the middle Atlantic, and the remaining three could be traced to Newfoundland. The severe temperature conditions of the month were mostly in the first half, and were prevalent more in the Southern and Western States than in the Northeast States; at 8 p. m. of the 1st Denver reported a fall in temperature of 48° in twenty-four hours and to —4°, but this cold wave had practically disappeared by the next a. m.; at 8 a. m. of the 7th, in connection with the ridge of high pressure noted above, there was quite a sharp fall in temperature in the middle Gulf States; Mobile had 30° fall in twenty-four hours. This cold spell culminated in Florida at 8 p. m. of the 8th. Jacksonville reported a fall of 40° at 8 a. m. of the 9th. In connection with same ridge the Middle Atlantic States experienced decidedly low temperatures. Atlantic City and New York had a fall of 32°, and Washington a temperature of —6°. The low temperature of this period continued till a. m. of the 11th; at 8 a. m. of 10th Washington reported —8°, and the next morning, —15°.

At 8 p. m. of the 11th, as high III approached the middle Mississippi Valley, Amarillo and Oklahoma reported a fall of 40°, and to —10° and 4°, respectively, and the next a. m. Galveston had a fall of 32° and to 10°. This cold wave moved eastward with the high area, and culminated in Florida on the 13th; at 8 a. m. Jacksonville reported a fall of 38° and to 10°.

As high No. V moved to the middle Mississippi Valley sharp falls in temperature occurred in the Missouri Valley; Moorhead reported a fall of 28°, and to —4° at p. m. of the 26th; at 8 a. m. of the 27th this cold wave reached the lower Lake region, Cleveland reporting a fall of 28° and to 26°.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long W.	Length.	Duration.	Daily.	Hourly.
High areas.		°	°		°	°	*Miles.*	*Days.*	*Miles.*	*Miles.*
I	*29, a. m.	54	109	2, a. m.	33	78	2,700	4.0	675	28.1
II	7, a. m.	52	108	11, p. m.	41	76	1,980	4.5	440	18.3
III	9, p. m	50	116	17, a. m.	47	56	5,370	7.5	716	29.8
IV	21, p. m.	52	117	27, a. m.	46	58	3,660	5.5	665	27.7
V	24, p. m.	53	118	28, p m.	32	77	2,780	4.0	682	28.4
VI	27, a. m.	53	110	†3, a. m.	47	59	2,910	4.0	728	30.3
Total							19,350	29.5	3,906	162.6
Mean of 6 paths							3,225		651	27.1
Mean of 29.5 days									656	27.3
Low areas.										
I	1, a. m.	47	126	4, p. m.	45	54	4,470	3.5	1,277	53.2
II	3, p. m.	29	101	6, a. m.	36	75	1,740	2.5	696	29.0
III	5, p. m.	28	95	9, p. m.	49	54	2,790	4.0	697	29.0
IV	8, p. m.	30	107	14, p. m.	48	53	3,690	6.0	615	25.6
V	13, a. m.	32	116	17, a. m.	39	70	2,910	4.0	728	30.3
VI	14, p. m.	51	117	19, p. m.	46	59	2,790	5.0	558	23.3
VII	20, p. m.	37	98	24, a. m.	48	56	2,460	3.5	703	29.3
VIII	23, a. m.	32	115	28, a. m.	47	59	3,420	5.0	684	28.5
IX	26, p. m.	48	124	†1, a. m.	50	62	3,090	2.5	1,236	51.5
Total							27,360	36.0	7,194	299.7
Mean of 9 paths							3,040		799	33.3
Mean of 36 days									760	31.7

*January. †March.

Lows.—Three of the storms were first noted on or near the north Pacific coast, and three more on the south Pacific coast, the remaining three in the west Gulf. The general motion was toward the east and northeast. Seven of the storms dis-